IN THE SPECIFICATION:

Please enter the following amendments to the specification:

Page 1, paragraph 2:

There have been suggested many apparatuses and methods for molding a thermoplastic resin foam, for example, in Japanese Unexamined Patent Publication Hei 8-258096 and No. Hei. 10-230528. The methods include the steps of melting thermoplastic resin inside the cylinder of an injection-molding machine, permeating the melted thermoplastic resin with an inert gas such as carbon dioxide gas or nitrogen gas under a supercritical state, and injecting the melted resin, permeated by the gas, into the mold. The apparatus for forming a fine foam, disclosed in the aforementioned Japanese Unexamined Patent Publication Hei. 8-258096, is constructed in general as follows. That is, the apparatus comprises a heating cylinder, a main screw provided inside the heating cylinder, a mixing screw provided on the top end portion of the main screw, and ~~a~~ <u>an</u> inert gas supply unit for supplying an inert gas to the mixing screw portion. Thus, when the main screw is rotatably driven to feed pelletized resin material toward the top end portion of the heating cylinder, the pelletized resin material is melted and then further uniformly melted with the mixing screw. At this time, when a carbon dioxide gas is supplied to the melted resin, the carbon dioxide gas permeates the melted resin material. Injecting the melted resin material permeated by the carbon dioxide gas into a mold by driving the main screw in the axial direction will provide a fine foam. On the other hand, the apparatus for forming a thermoplastic resin foam, disclosed in Japanese Unexamined Patent Publication Hei. 10-230528, is constructed as follows. That is, the apparatus comprises two separate units such as a successive plasticizing unit having a heating cylinder and a screw, and an injecting unit having a plunger. Thus, the two

units can also provide a thermoplastic resin foam as follows. That is, when the screw is rotatably driven to melt the pelletized resin material and a carbon dioxide gas is supplied to the melted resin, the carbon dioxide gas permeates the melted resin material. The melted resin material permeated by the carbon dioxide gas is injected into the mold of the injecting unit having the plunger by driving the screw in the axial direction. Then, the plunger is driven to provide a thermoplastic resin foam in the same manner.

A1

Page 3, paragraph 3:

To achieve the aforementioned object, the present invention provides an apparatus for forming a thermoplastic resin foam, which is constructed as follows. That is, the apparatus comprises a screw cylinder having a material supply hole arranged near a rear end portion of one end of the screw cylinder, and an injection nozzle arranged on a top end portion of the other end of the screw cylinder. The apparatus also comprises a screw provided in said screw cylinder for being rotatably driven in directions of plasticization and injection, and a drive means for driving said screw in the directions of plasticization and injection. The apparatus is constructed such that said screw corresponds to said screw cylinder and is selected as a first ~~metalization~~ metered, or plasticizing, portion, a low-pressure portion, and second ~~metalization~~ metered, or plasticizing, portion in that order from the rear end portion to the top end portion. A gas supply hole for injecting an inert gas is disposed at a position corresponding to the low-pressure portion of said screw of said screw cylinder. The inert gas is a carbon dioxide gas or a nitrogen gas having, at least in pressure, a pressure equal to or greater than a supercritical pressure or under a supercritical state. Said drive means comprise an electric servomotor.

A2

Page 9, paragraph 1:

A3

The present invention provides a method for forming a thermoplastic resin foam. The screw corresponds to said screw cylinder and is selected as a first ~~metalization~~ metered, or plasticizing, portion, a low-pressure portion, and second ~~metalization~~ metered, or plasticizing, portion in that order from a rear end portion to a top end portion of said screw. Furthermore, an inert gas having, at least in pressure, a pressure equal to or greater than a supercritical pressure or an inert gas under a supercritical state is injected into a position corresponding to the low-pressure portion of said screw of said screw cylinder.

Page 14, paragraph 1:

A4

The screw 20 moves in the axial direction upon plasticization and injection. As shown in Fig. 1, the rear end portion of the screw 20 is a first stage S1 and the top end portion thereof is a second stage S2, corresponding to the screw cylinder 1 to some extent. The first stage S1 comprises a supply portion K and a first ~~metalization~~ metered (plasticizing) portion M1 after or downstream of the supply portion K. The supply portion K corresponds to the material supply hole 7 of the screw cylinder 1 and has a comparatively deep screw groove 21. The screw groove 21 changes gradually in depth from the groove of the supply portion K to the groove of the first ~~metalization~~ metered (plasticizing) portion M1, the screw groove 21 of the first ~~metalization~~ metered portion M1 being shallower in depth. The thermoplastic resin material J fed from the supply portion K by the rotation of the screw 20 melts, while being subjected to heat provided by the heaters 9 installed on the screw cylinder 1, compression, and shearing. Thus, the

A4

thermoplastic resin material J melts completely at the first ~~metalization~~ metered portion M1. This prevents leakage of an injected inert gas toward the supply portion K. That is, the melted resin provides for sealing.

Page 15, paragraph 1:

A5

The second stage S2 comprises the low-pressure portion T located after the first stage S1 and a second ~~metalization~~ metered (plasticizing) portion M2 downstream thereof. The screw groove 21 of the low-pressure portion T is deeper. This causes a reduction in pressure of the melted resin fed from the first stage S1 to keep the low-pressure portion T at a low pressure even when filled with the melted resin. In some cases, a starved feed portion is produced. Consequently, it is made easy to inject an inert gas to the low-pressure portion T. In addition, the low-pressure portion T is adapted to have a length enough to cover the gas supply hole 2 when the screw 20 has moved in the axial direction. The screw groove 21 of the second ~~metalization~~ metered portion M2 is shallow in depth, being filled with the melted resin. This allows the inert gas injected to be sealed with the melted resin of the second ~~metalization~~ metered portion M2.

Page 16, paragraph 1:

A6

Now, another example is explained below, in which the aforementioned apparatus for forming a thermoplastic resin foam is employed. First, the thermoplastic resin material J is put into the hopper 10. The completion time of plasticization is set such as to the position of the screw 20 with the setting device provided on the controller 40. It is also programmed to brake

the electric plasticization servomotor 32 and the electric injection servomotor 31 when the completion time of plasticization is detected which has been set. In addition, various values necessary for plasticization are set. These values include the upper and lower pressure limits of the inert gas, the pressure of the second ~~metalization~~ metered portion M2, the pressure inside the measurement chamber 4, the temperature of the heaters 9, and the rotational speed of the screw 20. Then, the shut-off valve 6 is closed to drive the screw. The thermoplastic resin material J is then supplied to the screw cylinder 1 at the pre-set ratio. The electric plasticization servomotor 32 is activated to allow the rotational shaft 38 to rotate. This causes the large gear 37 to be driven via the ball spline 39, and thus the screw 20 is rotatably driven at a predetermined speed. While being fed by the rotation of the screw 20, the thermoplastic resin material J supplied from the hopper 10 melts by the heat applied from outside and produced by the shearing and frictional effects of the rotation of the screw 20, as conventionally known. Thus, the thermoplastic resin material J is fed to the first ~~metalization~~ metered portion M1, where it melts completely. Then, it is fed to the second stage S2. At this time, the temperature inside the screw cylinder 1 has reached the supercritical temperature of the inert gas, for example, a temperature of 100□C or more. Accordingly, the thermoplastic resin material J is accumulated in the measurement chamber 4 at the front of the screw cylinder 1. The screw 20 will retreat due to the pressure of the resin in proportion to the amount of the resin accumulated. The retreat of the screw 20 will cause the drive body 36 and the ball nut 34 to retreat. The ball screw 33 will rotate against the pre-set torque of the electric injection servomotor 31. This thereby provides a predetermined back pressure.

Page 17, paragraph 1:

When the timer of the controller 40 has counted to the pre-set time upon measurement in the foregoing, an inert gas is injected from the gas supply hole 2 to the low-pressure portion T of the second stage S2. The inert gas is a gas under the supercritical state such as a carbon dioxide gas or a nitrogen gas, or a gas at a pressure equal to or greater than the supercritical pressure. The melted resin in the first ~~metalization~~ metered portion M1 prevents the leakage of the injected inert gas toward the supply portion K. In addition, upon injection of the gas, the screw groove 21 of the low-pressure portion T is made deeper and the pressure of the melted resin made lower. This makes it possible to inject the inert gas at a comparatively low pressure of about a few Mpa to 20MPa, which is equal to or greater than the supercritical pressure. The injected inert gas is at a supercritical temperature, for example, a temperature equal to or greater than 100□C in the screw cylinder 1. This makes it easy for the inert gas to permeate the melted resin by the rotation of the screw 20. Thus, the thermoplastic resin material J is fed to the second ~~metalization~~ metered portion M2 of the second stage S2. During this step, the inert gas is supplied so as not to prevent the second ~~metalization~~ metered portion M2 from being lowered below the supercritical pressure. Here, the melted resin in the second ~~metalization~~ metered portion M2 prevents the forward leakage of the injected inert gas. The timing for supplying and stopping the inert gas can also be controlled with the position of the resin being measured.

Page 21, paragraph 2:

As described above, according to the present invention, the screw is selected, corresponding to the screw cylinder, as the first ~~metalization~~ plasticizing portion, the low-

pressure portion, and the second ~~metalization~~ plasticizing portion, from the rear to the front end portion. The gas supply hole is provided at the position corresponding to said low-pressure portion of the screw on the screw cylinder. This provides an effect of injecting easily into the screw cylinder an inert gas having a pressure equal to or greater than the supercritical pressure or an inert gas under the supercritical state. The gas supply hole is located between the first and second ~~metalization~~ plasticizing portions. At this time, this provides accordingly such an effect that the injected inert gas is sealed with the melted resin at the first and second ~~metalization~~ plasticizing portions. In addition, a drive means for driving the screw in the directions of plasticization and injection comprises electric servomotors. This allows for composite operation of the screw during molding, especially during the plasticization step. Thus, such an effect unique to the present invention is provided that foaming can be prevented inside the screw cylinder to provide a high-quality thermoplastic resin foam.

Page 22, paragraph 1:

In addition, after the plasticization step, the following inventions make it possible to prevent a reduction in pressure of the melted resin in which the inert gas has been dispersed inside the screw cylinder. Here, the inventions include the invention of preventing the screw from retreating by applying brake to the electric servomotor, and the invention of performing the plasticization step immediately before the injection step. The inventions also include the invention of driving the screw at low speed in the direction of plasticization until immediately before the injection step is initiated. Also included is the invention of driving the screw in the direction of measurement when the pressure has reduced below the pre-set value inside the screw

cylinder or of stopping the screw when the pre-set pressure has been reached. Thus, such an effect unique to the aforementioned inventions can be obtained that the foaming is prevented inside the screw cylinder to provide a fine high-quality thermoplastic resin foam. Furthermore, upon driving the screw in the direction of plasticization, an effect of accelerating the permeation and making uniform dispersion of the inert gas in the melted resin can be obtained by the following invention. That is, the invention of combining intermittently the driving of the screw in the direction of plasticization with the driving of the screw in the reverse direction of plasticization, or rotating the screw cylinder in the backward direction during plasticization provides the same effect. On the other hand, such an effect can be further obtained in addition to the aforementioned effect of preventing the foaming inside the screw cylinder, and accelerating the permeation and producing uniform dispersion of the inert gas in the melted resin in the following invention. The additional effect provided by the following invention is that the inert gas can be easily injected into the screw cylinder to seal the injected inert gas with the melted resin in the first and second ~~metalization~~ metered portions. The invention is limited among the aforementioned inventions in that an inert gas, at least in pressure, equal to or greater than the supercritical pressure or under the supercritical state is injected to the position corresponding to the low-pressure portion of said screw of the screw cylinder. Here, said screw is employed which is selected as the first ~~metalization~~ metered portion, the low-pressure portion, and the second ~~metalization~~ metered portion.